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Notes on South African Marine Mollusca 6. Thysanoteuthis rhombus (Cephalopoda) in Algoa Bay.[1]

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With 3 Text-figures and Plates II and III.

On October 13, 1961, Mr. R. D. McLean found a large Cephalopod on the beach near the lighthouse at Cape Recife, Algoa Bay, south-east of Port Elizabeth. It appeared to be dying, the suckers on the arms still showing reflex movements. The next morning it was taken to the Port Elizabeth Museum where it was deepfrozen after external measurements had been taken. The whole body was more or less uniformly coloured in exactly the same shade of brownish brick-red as *Loligo vulgaris*, the skin clearly showing the macrochromatophores. On arrival the body was still liberally covered with quantities of black ink from the ink gland.

The specimen was subsequently identified as a male of *Thysanoteuthis rhombus* Troschel 1857, having the left ventral arm hectocotylized. Unfortunately it was impossible to weigh the specimen when fresh, but it has been estimated to have weighed between 40 and 45 lbs. (roughly 18–20 kg.).

The following measurements of the fresh specimen were taken with a tape-measure :

Mantle length (dorsal)	800 mm. (800)
Greatest width from outer tip to outer tip of fins, close to the body	660 mm. (720)
Length of fins along body	650 mm.
Width of fins	235 mm.
Length of fins, top part	325 mm.
Length of fins, caudal part	490 mm.
Tentacle, tip to mouth	550 mm. (600, 620
First arm, tip to mouth	180 mm. (173)
Second arm, tip to mouth	185 mm. (205)
Third arm, tip to mouth	280 mm. (310)
Fourth arm, tip to mouth	210 mm. (203)
Hectocotylized fourth arm (left), tip to mouth	220 mm. (198)
Length of head (from origin of arms)	270 mm.
Largest width of head	180 mm.
Horizontal diameter of eye	41 mm.
Diameter funnel aperture	55 mm.
Length of visible part of funnel	75 mm.
Head (without arms) and body	920 mm.
Overall length (tip of tentacle to aboral end)	1470 mm.

The figures in brackets are the measurements of the adult male described by Pfeffer (1912). When comparing these figures, however, it must be borne in mind that his measurements were taken from a preserved specimen, which on that account will be larger than the present specimen. The largest specimen mentioned by Sasaki (1929) has a mantle length of 685 mm.

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[1] *Idem* 4, see *Basteria*, **25**, 1961 ; *idem* 5, Mollusca from the McArthur Bath, Port Elizabeth, see *Journal of Conchology*, **25**, 1962.

Thysanoteuthis rhombus is characterized by two triangular fins alongside the body (see Plates II and III) and the arms having two rows of relatively small pedunculate armed suckers and a dark reddish brown lateral expansion supported by white muscular threads. The expansion tapers rapidly towards the tip of the arm (text-fig. 1), but can be wider than the arm itself at or below the middle. The club of the tentacles has four rows of suckers, while the stem has only two rows of alternating suckers and papillae. Furthermore the shape of the gladius, the hectocotylized arm and the absence of luminous organs contribute to the special features of this remarkable Cephalopod.

The left ventral arm (fourth pair) is hectocotylized (text-fig. 2) ; it is a little thinner and longer than its normal counterpart and exhibits heavy ridges, more particularly towards the tip, and some irregularities in the rows of suckers. The only description of the hectocotylus available to the author (Pfeffer, *op. cit.*, pp. 533–534) differs only in minor details and size; Pfeffer's specimen has a hectocotylus which is 5 mm. shorter than the corresponding right arm, while in the present specimen it is 10 mm. longer. Individual variation probably accounts for these differences.

The eyes are typically Oegopsid with an open cornea. The lenses soon became loose and fell out of the eyes ; the one of the right eye, preserved in alcohol 70 per cent., has a diameter of 19 mm.

On dissection the mantle sac was found to be filled with sand which must have been sucked into the body when the animal was in its death throes on the beach. The white muscular layer under the thin skin showed a maximum thickness of 43 mm. ventrally ; this indicates that *Thysanoteuthis* is a powerful swimmer. Very probably the lateral expansions of the arms are adaptations to enable the animal to move forward easily. The gills measured 300 mm. Unfortunately the stomach contained only about 25 c.c. of opaque dark brown fluid. No internal or external parasites have been found. The anatomy of the species has been satisfactorily covered by Naef (1923), while both Jatta (1896) and Pfeffer (*op. cit.*) give quite elaborate descriptions.

The Needham's sac contained only four spermatophores, three of which were in various stages of immaturity. The one nearly mature spermatophore measured 75 mm. when fresh ; after fixation in Bouin's fluid and preservation

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PLATE II.

Thysanoteuthis rhombus Trosch., Cape Recife specimen shortly after having been found. Note the tapering aboral end, triangular fins, long third pair of arms and tentacles.

PLATE III.

Thysanoteuthis rhombus Trosch., Cape Recife specimen from right dorsal side. Note structure on fins. The ruler on the specimen measures 150 mm.

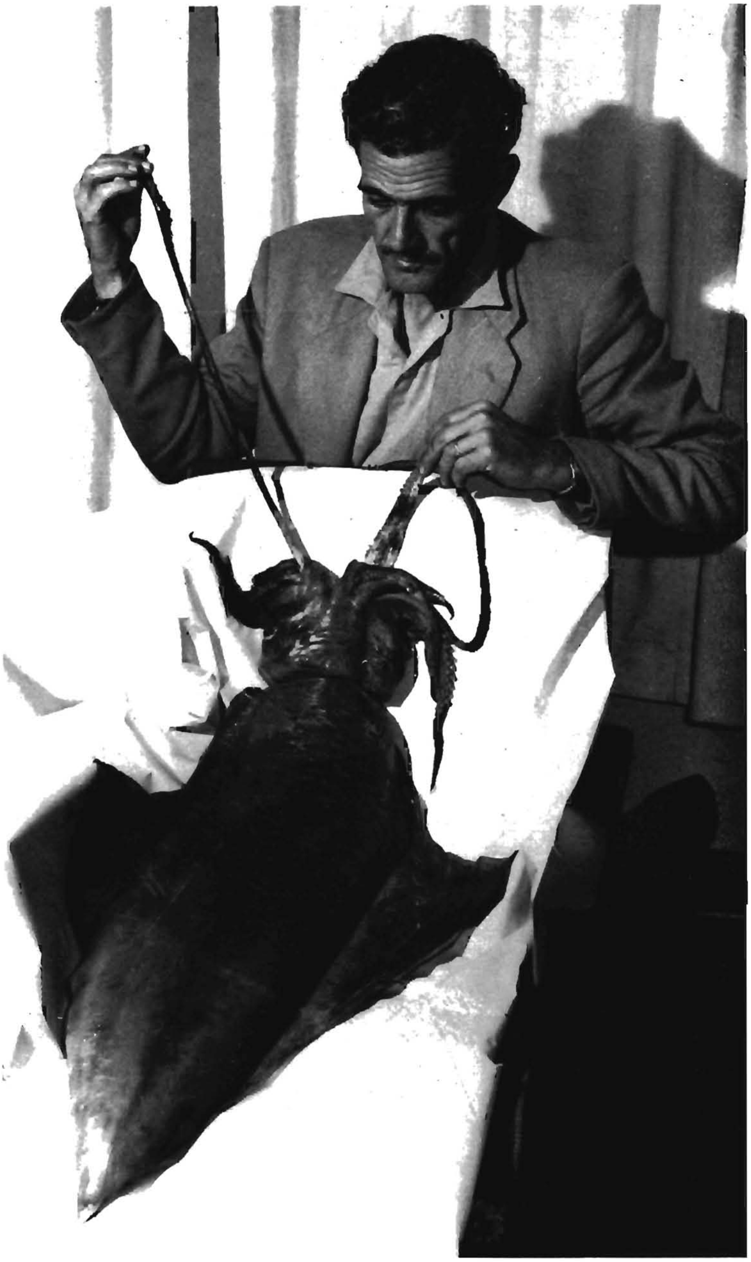

Photo: Evening Post, Port Elizabeth

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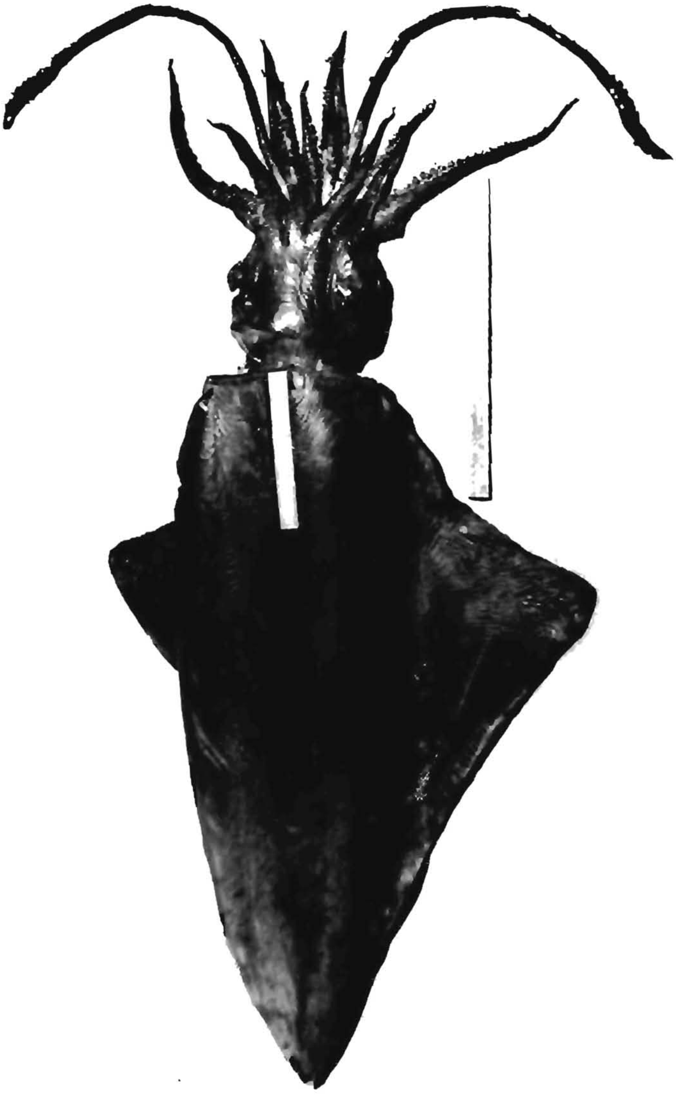

Photo: R. Liversidge

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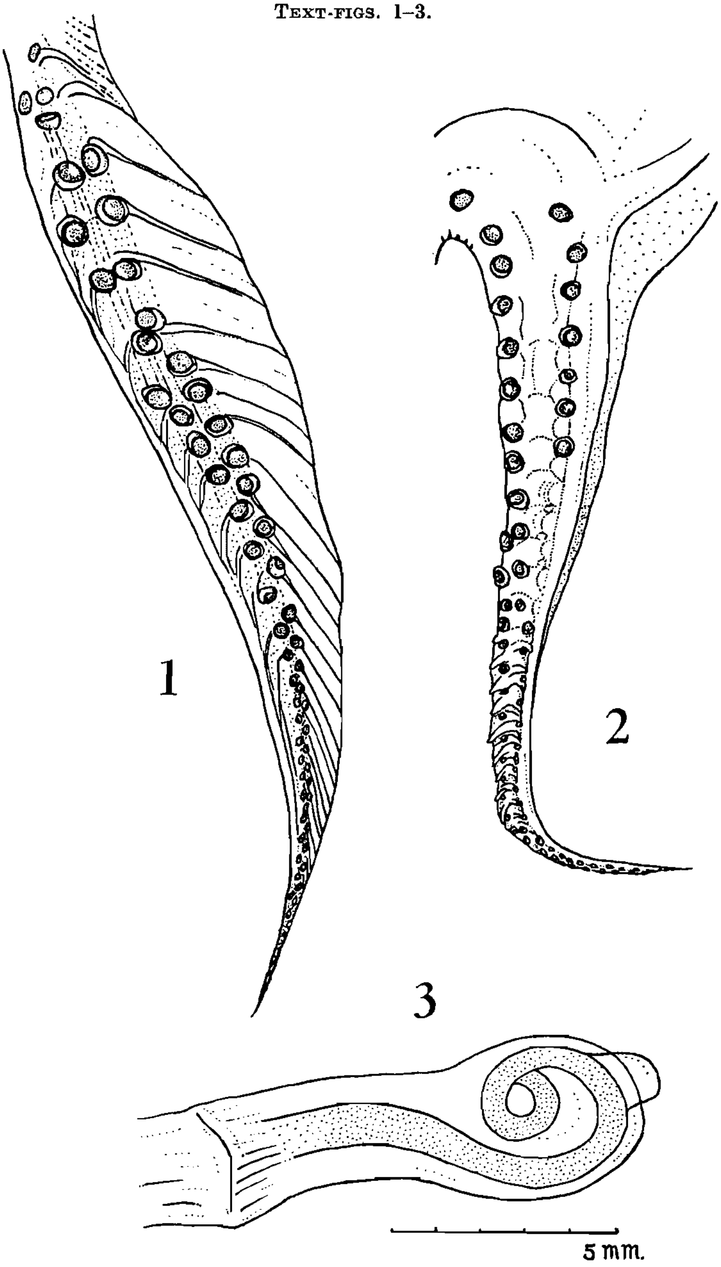
TEXT-FIGS. 1–3.



Thysanoteuthis rhombus Trosch., Cape Recife specimen. 1. Right third arm, inside, showing double row of armed suckers and lateral expansion (on the right) supported by muscular threads. Actual length 280 mm. 2. Hectocotylized left arm, inside. Note ridges towards the tip and lateral expansion on the right. Actual length 220 mm. 3. Oral end of almost mature spermatophore, enlarged.

in alcohol 70 per cent. it is 63 mm. long and has a greatest width of 1·5 mm. in the region of the sperm mass. The outer tunic proved to be rather impermeable, because some stains, such as Grenacher's Borax Carmine counterstained with Light Green, failed to penetrate it. Drew (1919) recommends Ehrlich's triple stain or Ehrlich's triacid stain ; these stains were satisfactorily absorbed but afterwards the specimens did not clear to an appreciable degree in glycerine. After some experiments with the immature spermatophores the almost mature specimen was transferred to pure glycerine, which cleared it sufficiently to enable some of the structures to be seen without any staining at all.

In shape and structure the spermatophores closely resemble those of *Loligo pealii* as described by Drew (*op. cit.*). Apparently the ejaculatory apparatus of the spermatophores of *Thysanoteuthis rhombus* is relatively shorter than in *Loligo pealii* and allied species. Usually this part (taken from the cement body to the oral end) is approximately one-quarter of the total length, but it is considerably shorter in my unique specimen, viz., only about 1/9 of the total length. This might be due to preservation methods employed here, although even then it is hard to explain, unless normal for the species under discussion. The tip of the sperm mass is marked on the outside of the spermatophore by a probably artificial collar-like structure (text-fig. 3). This structure obscures the inside at the site of the cement body, where this can be expected in comparison with the spermatophore of *Loligo pealii*. The ejaculatory apparatus shows a thick well-marked tube (see text-fig. 3) ; no spiral structure, however, could be observed. Text-fig. 3 can be compared with Drew's figures 25 and 26 on plate 3 ; it will be seen that there is little, if any, significant difference.

On the whole it seems that the spermatophore of *Thysanoteuthis rhombus* does not differ materially from that of *Loligo pealii* or allied species. Although no attempt has been made to employ spermatophores for diagnostic purposes, the uniformity of those already known probably hardly warrants this. Thiele (1935) does not mention the spermatophores in his classification of the Decapod Cephalopoda down to subgeneric level, as characters of (possible) value for the taxonomy of the group.

Apparently the permeability of the outer tunic increases with the maturing of the spermatophores, because the stains were more readily absorbed the older the spermatophores were.

The species has been described as *Thysanoteuthis rhombus* by Troschel in 1857 ; *T. elegans* Troschel 1857 and *T. nuchalis* Pfeffer 1912 have been considered synonyms (see *e.g.* Sasaki, *op. cit.*), the genus consequently being monotypic. Very probably *Sepioteuthis major* Gray 1828, founded on a mutilated specimen from the Cape of Good Hope (see Jatta, *op. cit.*; Tryon, 1879, p. 154 ; " Length of body, 27 inches ; . . . " = approximately 686mm.) also refers to the present species. Sasaki (*op. cit.*) considers it a synonym of Troschel's more recently described species ; some authors before Sasaki have done the same. Adam (1939) has also mentioned it. Pending further research such as examination of

Gray's type specimen (if any), it is perhaps advisable to consider this name a *nomen dubium* ; if properly established it has priority over Troschel's name : *Thysanoteuthis major* (Gray).

The genus *Thysanoteuthis* constitutes a family of its own, although Thiele (*op. cit.*) apparently hesitatingly included the insufficiently known genus *Cirrobrachium* Hoyle 1904. He includes the Thysanoteuthidae in the series Ommatostrephidae — Thysanoteuthidae — Chiroteuthidae — Joubiniteuthidae —Cranchiidae. The latest classification by Morton (1958) varies this to the following extent : Ommatostrephidae—Sthenoteuthidae (according to Thiele a subfamily of the Ommatostrephidae) — Thysanoteuthidae — Chiroteuthidae —Cranchiidae—Lampadioteuthidae. Doubtlessly *Thysanoteuthis* is closely allied to the Ommatostrephidae and Sthenoteuthidae, but by virtue of its combination of characters merits a separate family (see *e.g.* Naef, *op. cit.*).

If we regard the identity of *Sepioteuthis major* as doubtful (see above), then the present specimen is only the fourth on record from the South African coast. The known Cape specimens compare as follows[1]) :

No.	Sex	Locality	Mantle length	Particulars
1.	?	St. James False Bay (Cape Peninsula)	480 mm.	Cast in South African Museum, vide Barnard, 1934
2.	?	do. II. 1918	not recorded	not preserved, vide Barnard, 1934
3.	female	Clifton Beach (Cape Peninsula) 14.XI.1947	760 mm.	Specimen and cast in South African Museum, vide Barnard, 1947
4.	male	Cape Recife (Algoa Bay) 13.X.1961	800 mm.	specimen in Port Elizabeth Museum

The species is apparently rare though widely distributed in the central Mediterranean (Tyrrhenian Sea), south-eastern Atlantic (Cape Peninsula), south-western Indian Ocean (Algoa Bay), north-western Pacific (both sides of Japan, East China Sea) and probably also in the open Atlantic (vide Pfeffer, *op. cit.*, p. 531). Most South African specimens have been recorded in the southern summer. It is likely to be a pelagic species and very probably occurs in all the oceans of the world. The absence of luminous organs shows that it is probably not a deep-sea dweller (see also Sasaki, *op. cit.*).

The Cape Recife specimen is preserved in the Port Elizabeth Museum in a polythene bag in alcohol 70 per cent. and bears the catalogue number 1492/1.

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[1] Additional data kindly supplied by Dr. K. H. Barnard in litt.

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[1] Not seen by author ; data supplied by Dr. Adam.